

Discussion Topics for Conceptual Model Refinement

Results of the recently conducted geophysical and benthic habitat survey (including sediment profile imaging) of the Lower Passaic River (Aqua Survey, Inc., 2005a, b; Germano & Associates, Inc.) are of use in developing a more refined and site-specific Conceptual Site Model (CSM) to support of the Baseline Ecological Risk Assessment (BERA). Both surficial and sub-surface geology and benthic habitat structure of the river from the Dundee Dam to its confluence with the Hackensack River were investigated. Together these studies provide the most detailed assessment of conditions at the sediment/water interface currently available for the entire study area.¹ Survey findings that are relevant for refining the CSM (including water and sediment substrate classification and benthos) are summarized in Table 1 and discussed below. Principal conclusions derived from a preliminary assessment of these data include the following:

- The extent of freshwater habitat within the study area may extend farther downstream than previously appreciated and represent well over 50 percent of the study area;
- River sediment in the upper and lower reaches of the study area consists predominately of rock/gravel and silt, respectively, whereas substrate in the middle reaches is more variable. Substrate characteristics are obviously one of the primary determinants of macroinvertebrate community structure and these data should be considered in refining the CSM; and,
- Benthic macroinvertebrate communities in the Lower Passaic River are characterized by their generally low diversity and abundance, as well as degree of spatial heterogeneity. In part, the structural variability is likely a reflection of the identified patterns of relative substrate stability.

Water Classification – NJDEP classifies the reach of the Passaic River between Dundee Dam and the confluence with the Second River as freshwater (FW2-NT/SE2)²; between the confluence with the Second River and its mouth, the Passaic River is classified as saline water associated with estuaries (SE3). The tributary of the Second River is located between Transects T17 and T18 (approximate RM 7.5; see Figure 1e, Germano and

¹ Further information is anticipated following completion of the 2006 field sampling program (including habitat characterization and biota survey work).

² The FW2 designation refers to those non-pristine freshwater bodies that have been subjected to various wastewater discharges and/or increased anthropogenic runoff and, as a result, does not meet criteria for designation as a FW1 (or Pineland Waters) resource water (NJDEP, 2005). Designated uses for FW2 waters include: (i) maintenance, migration, and propagation of the natural and established biota; (ii) primary and secondary contact recreation; (iii) industrial and agricultural water supply; (iv) public potable water supply (after conventional filtration and disinfection); and (v) any other reasonable uses (NJDEP, 2005). NT indicates that a water body has not been designated (and due to its physical, chemical, and/or biological characteristics is likely to be incapable of supporting salmonids) as a “trout production or trout maintenance” resource water (NJDEP, 2005). SE is the general classification for estuarine (saline) surface waters; designated uses for both SE2 and SE3 designated waters are similar and include: (i) migration of diadromous fish; (ii) maintenance of wildlife; (iii) secondary contact recreation; and (iv) any other reasonable uses. An SE2 water is also assigned the designated use of “maintenance, migration, and propagation of natural and established biota” whereas an SE3 water is assigned a designated use of “maintenance and migration of fish population”.

Associates, 2005). In addition, T18 is the most downstream transect where dipteran midge larvae were collected in the benthic macroinvertebrate samples (Table 1); as with other benthic macrofauna, this non-estuarine (i.e., salt-intolerant) taxon is an integrator of environmental exposures and may provide a good approximation of most downriver extent of consistently freshwater conditions. This issue can be resolved once adequate salinity data throughout this reach have been collected and reviewed.

Sediment Substrate Classification – Although the river bed sediment is comprised predominately of silts, organic rich sediment as well as a range of gravels to fine graded sands, and clays were detected during the geologic survey. Sidescan sonar data were used to develop a geological characterization of the bed sediment for the entire study area (Aqua Survey, Inc, 2005a). A simplified surficial riverbed classification map was prepared (Aqua Survey, 2005a) that supports the following conclusions:

- Silt predominates throughout the study area, with varying combinations of silt, sand, and gravel present;
- Riverbed much more varied above the West Arlington Railroad Bridge, with the channel consisting of sand or silt/sand with silts limited to depositional areas (e.g., inside of bends in the river);
- Rock and gravel often found along the river edge associated with bulkheads and riprap; and,
- Riverbed substrate consists primarily of sand and gravel (with large rock and boulders) upstream from the vicinity of the 8th Street Bridge.

Benthic Survey. Aqua Survey, Inc. (2005b) collected 28 benthic infaunal samples at locations evenly distributed throughout the 17 mile study area; samples were collected at approximately 25% of the locations where Sediment Profile Imaging data were also collected (Germano and Associates, Inc., 2005).

- Benthic macroinvertebrate community throughout the study area is characterized by low taxonomic diversity (species richness ranged from 2 – 9 and 1 – 10 in the freshwater and brackish reaches, respectively);
- The community at most locations is dominated by one or two taxa that are tolerant to environmental stress (the dominant taxon comprised up to 86.2% and 100% of the samples in the freshwater and brackish reaches, respectively);
- Results of the Sediment Profile Imaging (SPI) suggest that the benthos in the reach exist in a state of flux due to relative substrate instability – successional status is variable both within and between successive transects; there is also evidence that the infauna are continually at risk of being buried by newly deposited sediments;
- Benthic communities in freshwater reach dominated by chironomids (midge fly larvae, amphipods (*Gammarus* sp.), and oligochaetes; in brackish reach oligochaetes and polychaetes dominate;
- Abundance appears to be highly variable with a range of 5 – 967 organisms/sample across the entire study area; and,

- Results for lower reach appear comparable to community data collected by TSI in Fall 1999/Spring 2000.